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Science Trails Vaccine Against Undiagnosed Viral Infections

THE CHEMOTHERAPY of virus disease is one of the most urgent challenges to medical research. In contrast to the large arsenal of chemical weapons at our disposal for combatting bacterial infections, we have no comparable battery to use against viruses. So preventive vaccination remains the most effective defense, and a very limited one for many important diseases.

Vaccination is used to provoke the human body to produce specific antibodies capable of neutralizing free virus particles before they have been widely entrenched in cells. If the infection has already become entrenched, the antibodies have very little useful impact on it. Furthermore, we don't know how to make safe and effective vaccine for use against many viruses.

Thus researchers have long been interested in less specific antiviral agents. These would allow therapy to begin against many viral infections before a specific

diagnosis was made—a process that would often take much too long in relation to the time course of the infection.

THE DISCOVERY by Dr. Alick Isaacs of interferon, and its further characterization as a protein with a broad range of virus-inhibitory action, is one of the most promising avenues of current research in this field.

It had long been known that a cell infected with one virus would not readily sustain the growth of another. This can now be attributable, in mammalian cells, partly to the production of the interferon protein in response to the first infection. Dr. Isaacs reasoned that relatively innocuous viruses might be purposely introduced to stimulate the production of interferon, or else that interferon might be purified from animal tissues for clinical use in man.

Interferon has had promising effects on experimental viral infections, but some hopes for its wide use were

dashed by the finding that interferon from one species would not work except in cells of the same or closely related species. No practical way to produce human interferon in clinically useful quantities is apparent.

Ultimately, it may be possible to synthesize it, but we are still some way from handling the synthesis of proteins of interferon's rather large size (molecular weight 70,000, compared to 5734 for insulin, which has been synthesized).

VIROLOGISTS have, then, turned to agents that might behave like viruses in inducing treated cells to synthesize their own interferon.

A research team from the Merck Institute for Therapeutic Research recently reported that certain types of RNA (ribonucleic acid) were efficient interferon-inducers. It was an intellectually satisfying insight that these RNA's resembled those of certain viruses in displaying a double-stranded structure, usually associated with DNA rather than RNA, in normal cell constituents. In fact one of these inducers had already been described as an antiviral agent named heleinine, and only now is proven to be an RNA.

These reports seemed to point to one of the first practical applications of a nucleic acid in medicine, apart from the extraordinary conceptual impact of our knowledge of RNA and DNA.

Other interferon-inducers have, however, been reported that show a much wider basis for doing so. In particular, Dr. Thomas Merigan at Stanford University has shown that there is such activity in synthetic polymeric acids which have a much simpler structure than nucleic acids. These compounds have certain disadvantages; particularly, they are too stable and therefore are not rapidly eliminated from the body. Further research is in progress, however.

While these approaches may give us useful, expedient drugs, the most important long-term benefits will derive from understanding how interferon modifies the cell to inhibit virus growth, and yet leave the cell still able to use its proper RNA and DNA for healthy pursuits.

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